



# THE UNIVERSITY OF CHICAGO

Departments of Computer Science, Mathematics, Statistics and the Computation Institute  
**SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR**

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## Randomized QR Factorization with Column Pivoting

THURSDAY, March 30, 2017 at 4:30 PM  
226 Jones Laboratory, 5747 S. Ellis Avenue  
Host: Lek-Heng Lim

### ABSTRACT

Factorizing large matrices by QR with Column Pivoting (QRCP) typically requires substantially more processing time than QR without pivoting, owing to the communication costs required to process pivoting decisions. In contrast, randomized QRCP (RQRCP) algorithms have proven themselves empirically to be highly competitive with high-performance library implementations of QR in processing time, on uniprocessor and shared-memory machines, yet as reliable as QRCP in pivot quality.

We show that RQRCP algorithms can be as reliable as QRCP with failure probability that exponentially decays with oversampling size. We investigate different updating formulas used in RQRCP and discuss the efficiency differences. We analyze the numerical stability of different RQRCP algorithms. Meanwhile, our distributed-memory implementation of RQRCP is significantly more efficient than the QRCP routines in ScaLAPACK.

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